

**A redescription of *Echinocephalus uncinatus* Molin, 1858
(Nematoda, Gnathostomatoidea)
from European rays, *Dasyatis pastinaca* (Linnaeus, 1758)**

by Ian BEVERIDGE

Abstract. — Specimens of *Echinocephalus* Molin, 1858 from *Dasyatis pastinaca* (Linnaeus, 1758) from the Black sea are described and attributed to *E. uncinatus* Molin, 1858. Additional morphological data are given on *E. spinosissimus* (Linstow, 1905) from elasmobranchs from the Indian ocean. Both species are considered valid. They differ in the length of the spicules, the shape of the spicule tip and the ornamentation of the alae on the male tail.

Résumé. — Des spécimens d'*Echinocephalus* Molin, 1858 provenant de *Dasyatis pastinaca* (Linnaeus, 1758) de la mer Noire sont décrits et attribués à *E. uncinatus* Molin, 1858. Les compléments morphologiques donnés sur *E. spinosissimus* (Linstow, 1905) provenant de deux espèces de sélagiens de l'océan Indien montrent que les deux espèces de nématodes sont valides. Elles sont différenciées par la longueur et la morphologie des spicules et par l'ornementation de la queue du mâle.

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For many years, confusion has existed in the literature over the distinction between *Echinocephalus uncinatus* Molin, 1858, and *E. spinosissimus* (Linstow, 1905), both parasitic in the spiral valve of elasmobranchs. BAYLIS and LANE (1920), the first workers to review the genus maintained the two species as distinct, but applied the name *uncinatus* to a larval stage and *spinosissimus* to an adult male both described originally from the same host from the Adriatic by MOLIN (1858) under the single name *uncinatus*. *E. spinosissimus* was described initially from rays from the Gulf of Manaar, India, but was considered a synonym of *uncinatus* by MILLEMAN (1963) and subsequent authors (TRONCY, 1969 ; Ko, 1975 ; DEARDORFF *et al.*, 1981) have generally accepted this synonymy. BAYLIS and LANE (1920) provided an adequate description of *E. spinosissimus*, however, the only description of the adult of *E. uncinatus* remains the very inadequate description of MOLIN (1858, 1861). Since a detailed redescription of adult *E. uncinatus* from new material should allow the question of the synonymy of the two species to be resolved, the opportunity is taken here of describing specimens from European elasmobranchs. The specimens are attributed to *E. uncinatus* and they are distinct from *E. spinosissimus*.

Material was examined from the collections of the Muséum national d'Histoire naturelle, Paris (MNHN) and the British Museum (Natural History), London (BM). Measurements are given in the text in millimetres. The nomenclature of the hosts follows KREFFT and STEHMANN (1973) and CAMPAGNO and ROBERTS (1982).

Echinocephalus uncinatus Molin, 1858

(Figs. 1-2)

MATERIAL EXAMINED : From *Dasyatis pastinaca* (Linnaeus, 1758) (syn. *Trygon pastinaca*), spiral valve, Agigea, Black Sea, Rumania, collected 10-23.VIII.1949, N. BACESCO, in MNHN N439 340MC, slides NVII 11-14 ; 2 ♂, 3 ♀.

DESCRIPTION

Large, stout nematodes ; body unarmed, covered with fine transverse striations ; tail of male forming loose spiral, tail of female straight. Mouth opening dorso-ventrally elongate, with 2 elongate, lateral pseudolabia ; lateral part of pseudolabium bulbous, almost rectangular in apical view with large amphid and double cephalic papilla on either side ; medial part of pseudolabium elongated dorsoventrally, trilobed ; each lobe bears 2 cuticular thickenings or "teeth" along external edges ; thickenings of opposite pseudolabia interlock ; teeth of dorsal and ventral lobes of pseudolabia visible only in median or oblique views of head, but may give appearance of small supernumerary interlocking teeth in slightly oblique apical views of head ; posterolateral surface of each pseudolabium with distinct cuticular serrations ; small dorsal and ventral interlabia present between pseudolabia, only clearly visible in specimens with pseudolabia fully everted, otherwise hidden between pseudolabia and bulb ; pseudolabia triangular in shape with small additional triangular projection at either side of apex. Cephalic bulb prominent, armed with numerous rows of small uncinata spines ; anterior rows incomplete, restricted to dorsal and ventral aspects of bulb ; rows of spines frequently discontinuous in mid-bulb region ; buccal capsule weakly developed, compressed laterally ; oesophagus elongate, clavate, divided into anterior muscular and posterior glandular parts ; nerve ring in anterior oesophageal region, immediately posterior to cephalic bulb ; 4 ballonets present ; deirid domed, immediately posterior to nerve ring ; 4 cervical sacs extend from cephalic bulb to mid-region of oesophagus. Tail conical, blunt ; tip without ornamentation.

Male : Total length 31, 40 ; maximum width 0.78, 0.84 ; cephalic bulb 0.47, 0.50 × 0.57, 0.80, armed with 38, 40 major rows of spines, followed by 4, 6 rows of very small spines, irregularly arranged in incomplete rows ; length of spines of major rows 0.011-0.013 (0.012) ; oesophagus 4.9, 5.6 long ; anterior muscular region 2.2, 2.4 long, posterior glandular region 2.5, 3.4 long ; nerve ring 0.80, 0.85 from anterior end ; deirids 1.30, 1.43 from anterior end ; cervical sacs extend 2.5, 2.55 beyond cephalic bulb ; tail 0.50, 0.60 long ; spicules subequal 1.00, 1.25 long, stout, striated, tapering to blunt tip ; gubernaculum present, V shaped in lateral view ; prominent alae on male tail, commencing 0.80, 0.90 anterior to tip of tail ; prominent rugose area on alae and tail, extending from second pair of caudal papillae to post-anal cluster of papillae ; bosses of rugose area arranged in transverse rows, fine, regular in shape ; ventral region of body between rugose areas and anterior to alae without bosses but with coarse striae approximately 0.010 apart ; dorsal region of body

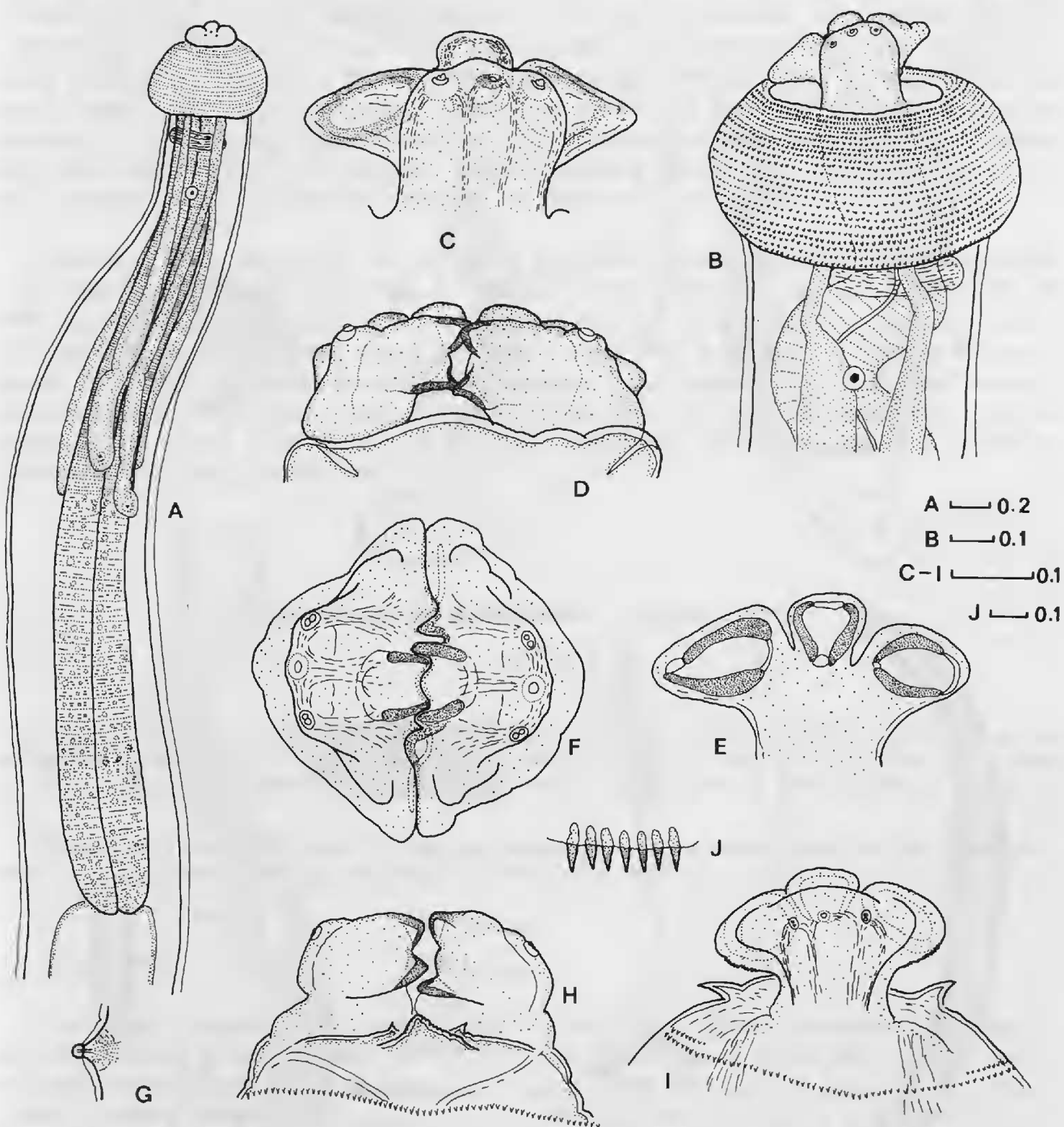


FIG. 1. — *Echinocephalus uncinatus* Molin, 1858. A, oesophageal region, lateral view ; B, cephalic extremity, lateral view ; C, pseudolabium, lateral view ; D, pseudolabium, median view ; E, pseudolabium, view of internal (medial) surface ; F, pseudolabia, apical view ; G, deirid, median view ; H, pseudolabia fully extended beyond cephalic bulb, showing interlabia, median view ; I, pseudolabia extended beyond cephalic bulb, lateral view, showing interlabia ; J, spines of cephalic bulb. (Scale lines in mm.)

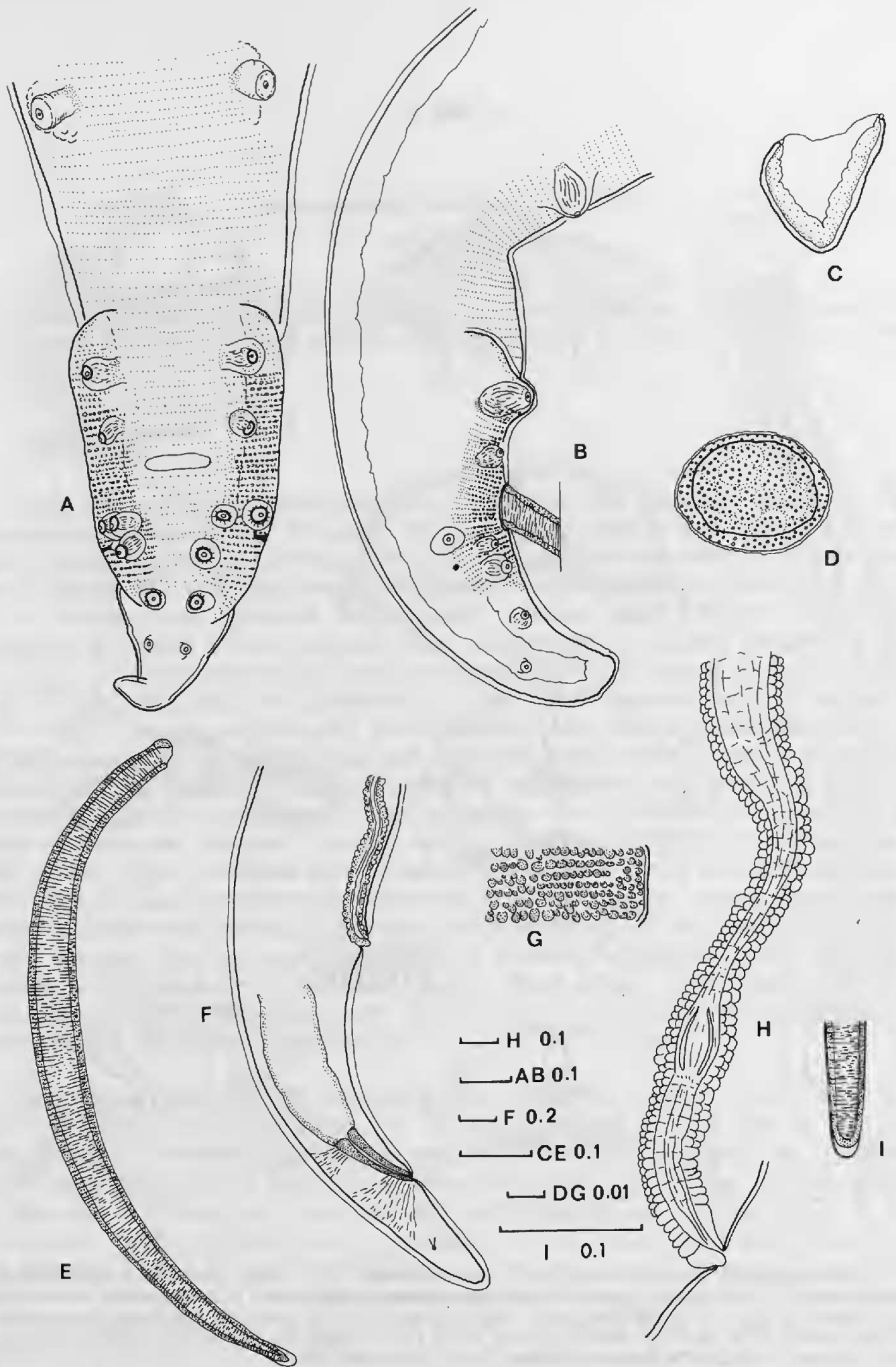


FIG. 2. — *Echinocephalus uncinatus* Molin, 1858. A, male tail, ventral view ; B, male tail, lateral view ; C, gubernaculum, lateral view ; D, egg ; E, spicule, lateral view ; F, female tail, lateral view ; G, detail of rugose area of male tail, ventral view ; H, female, vulva and vagina, lateral view ; I, spicule tip, lateral view. (Scale lines in mm.)

with striae only 0.002-0.003 apart ; striae change from coarse to fine along lateral margins of body ; 8 pairs of caudal papillae present in addition to phasmids ; first pair of papillae well anterior to alae ; second and third pair pre-anal, situated on lateral alae, second pair much larger than third pair ; fourth, fifth and sixth pairs form a cluster immediately posterior to anus, with fourth pair most lateral, and sixth most medial ; fifth pair of papillae smallest of series ; seventh pair of papillae small, situated posterior to remainder, at posterior end of alae ; eighth pair smallest, midway between seventh pair of papillae and tip of tail ; phasmids tiny, immediately posterior to fourth pair of papillae.

Female : Total length 25, 30, 25 (third specimen fragments only) ; maximum width 0.98, 1.00, 1.18 ; cephalic bulb 0.36, 0.57, 0.60 $\times$ 0.63, 0.80, 0.92 ; armed with 36, 37, 38 rows of spines ; spines 0.010 long ; oesophagus 5.2, 5.7 long ; anterior muscular region 2.4 long ; posterior glandular region 2.8 long ; nerve ring 0.60, 0.75 from anterior end ; deirids 0.78, 1.3, 1.4 from anterior end ; cervical sacs extend 2.7, 3.6 beyond cephalic bulb ; tail 0.50, 0.90 long, conical, blunt ; vulva 1.4, 2.5 from posterior end ; vagina (sphincter to vulva) 0.50, 0.55 long ; uterus prodelphic, didelphic ; egg oval, 0.045 $\times$ 0.035 with irregularly pitted shell.

***Echinocephalus spinosissimus* (Linstow, 1905)**

(Fig. 3)

MATERIAL EXAMINED : From *Himantura imbricata* (Bloch and Schneider, 1801) (syn. *Trygon walga* Müller and Henle, 1841) : Ceylon, coll. T. SOUTHWELL, in BM n° 1960.1176. — From *Urogymnus asperrimus* (Bloch and Schneider, 1801) : Ceylon, coll. T. SOUTHWELL, in BM n° 1920.5.3.9-12, 3 ♂, 1 ♀.

BAYLIS and LANE (1920) gave an adequate description of this species based on the same specimens. The following details are additional to their description.

DESCRIPTION

Two large triangular pseudolabia present ; lateral aspect of each pseudolabium bulbous, rounded, bearing central amphid with paired cephalic papillae on either side ; medial aspect of pseudolabium trilobed, dorso-ventrally elongate ; each lobe bears 2 cuticular thickenings ("teeth") along external edges ; thickenings of medial lobe interlock to give appearance of teeth in apical view ; thickenings or teeth of dorsal and ventral lobes of pseudolabia clearly visible only in median or oblique views of head, but in oblique views may appear as indistinct supernumerary teeth ; small triangular dorsal and ventral triangular interlabia present between pseudolabia.

Male : Spicules subequal, long, covered with fine, transverse striations ; tip blunt, broad, non-striated ; gubernaculum present, heavily sclerotised, triangular in lateral view,

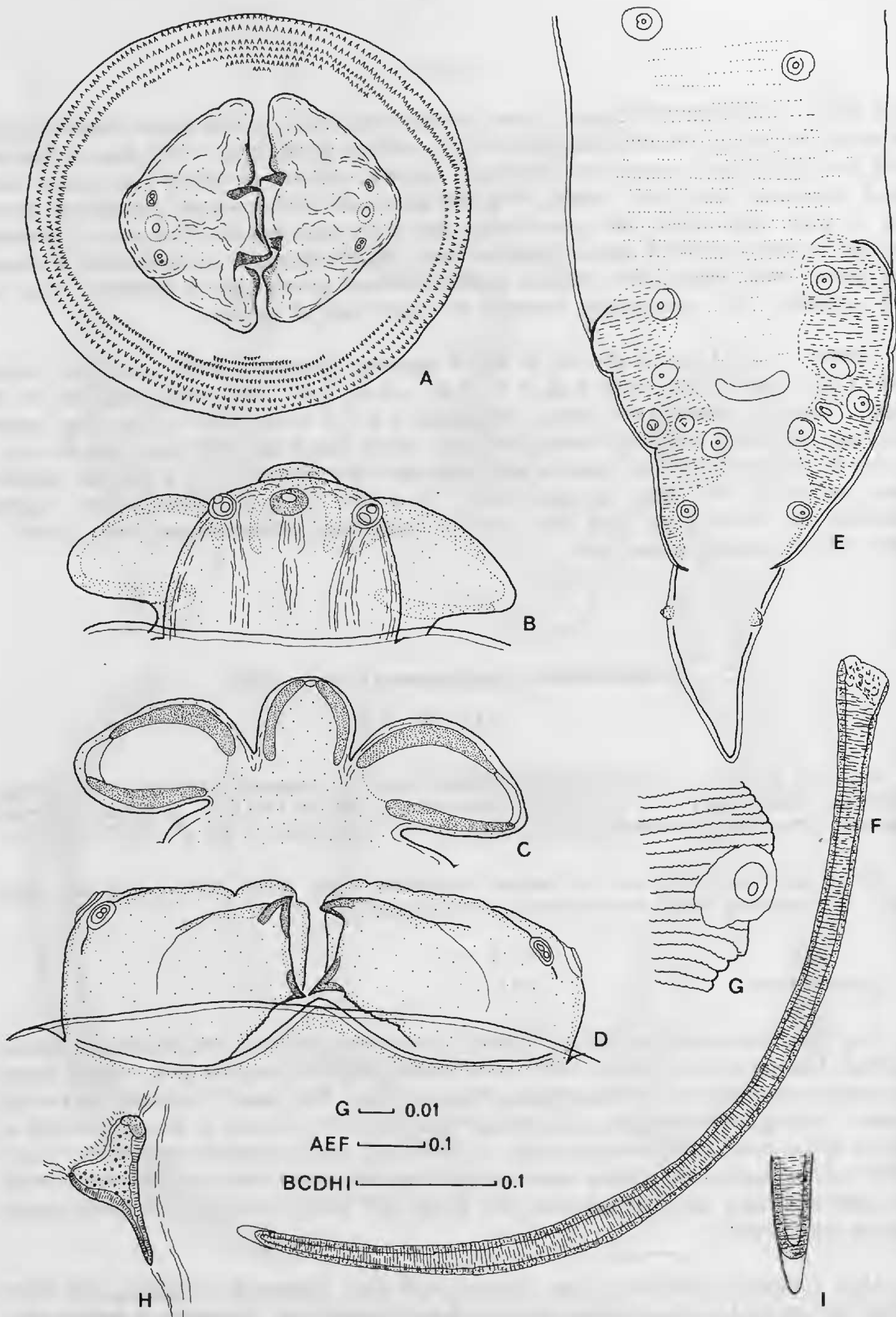


FIG. 3. — *Echinocephalus spinosissimus* (Linstow, 1905). A, head, apical view ; B, pseudolabium, lateral view ; C, pseudolabium, internal surface, medial view ; D, pseudolabium, median view ; E, male tail, ventral view ; F, spicule, lateral view ; G, detail of annulations on male tail, ventral view ; H, gubernaculum, lateral view ; I, spicule tip, lateral view. (Scale lines in mm.)

approximately W shaped in ventral view ; tail with prominent ventral alae ; rugose areas absent ; ventral annulations in vicinity of cloaca and on alae widely spaced, with crenulate margins, approximately 0.010 apart ; striae on dorsal aspect of tail only 0.002 apart ; eight pairs of caudal papillae present ; first pair well anterior to alae ; second and third pairs preanal, situated on lateral alae ; fourth, fifth and sixth pairs form a cluster posterior to anus with fourth most lateral and sixth most medial ; fifth pair smallest of series ; seventh pair of papillae small, situated some distance posterior to remainder, near posterior end of alae ; eighth pair midway between seventh pair of papillae and tip of tail ; phasmids not seen.

DISCUSSION

Although somewhat limited by the availability of only a small number of specimens, the results presented above indicate quite unequivocally that there is at least one species of *Echinocephalus* in European elasmobranchs which is not identical with *E. spinosissimus* from the Indian Ocean. The European material differs from *E. spinosissimus* in the following features : spicules shorter (1.00-1.25 mm in European specimens ; 1.52-1.90 mm in *E. spinosissimus*) in worms of equal body length ; spicule tip slightly more obtuse in *E. spinosissimus* than in European specimens, and with a larger, transparent tip, and absence of an area rugosa on the tail of male *E. spinosissimus* which is present in the European specimens. The features of the cephalic region and of the female tail are similar in both species, as is the disposition of the papillae on the tail of the male. Interlabia are present in both species but have not been described previously. The differences in the spicule tips are slight, however, the differences in spicule length in worms of equivalent total length and the rugose areas are sufficient to show that the European material is specifically distinct from the Indian specimens, and the former is here assigned to *E. uncinatus*. *E. uncinatus* was initially described from *Dasyatis centroura* (Mitchill, 1815) (syn. *Trygon brucco* Bonaparte, 1834) from the Adriatic, while the material described above came from *Dasyatis pastinaca* (Linnaeus, 1758) from the Black Sea. LINSTOW (1904, in SHIPLEY and HORNEILL, 1904) reported *E. uncinatus* from *D. pastinaca*, but gave no morphological details, and in view of the poor quality of the descriptions available for the parasite, some question must remain as to its identity. As it is possible that more than one species of *Echinocephalus* occurs in European rays, the specimens described above are assigned to the taxon on a provisional basis only. Collections of *Echinocephalus* from the type host and type locality will be required to settle the matter, but *uncinatus* has been applied to the European specimens described above, and hence *E. spinosissimus* must be considered a distinct but closely related species.

MOLIN (1858, 1861) described *E. uncinatus* from two specimens, a male with numerous rows of cephalic spines, and a "female" with only six rows of spines, both from the same host in the Adriatic. It is apparent now that the female was in fact a larval stage. However, BAYLIS and LANE (1920) attributed the name *uncinatus* to MOLIN's "female" and applied the name *spinosissimus*, originally used by LINSTOW (1905) for specimens from the

Indian Ocean, to MOLIN's male from the Adriatic. The argument of MILLEMAN (1963) is accepted here, namely that BAYLIS and LANE (1920) were unjustified in applying MOLIN's name to a larval form. Although relatively little is known of the life history of *Echinocephalus*, MILLEMAN (1963) has reported the presence of larval and adult forms of the same nematode species in the same definitive host, and this was almost certainly the situation applying to MOLIN's collection. Because of this, the name *uncinatus* should be applied to MOLIN's adult male specimen from *Dasyatis centroura* from the Adriatic, while LINSTOW's name, *spinosissimus*, should apply to specimens originally described from *Myliobatis aquila* (Linnaeus, 1758) from the Gulf of Manaar, Indian Ocean, and redescribed by BAYLIS and LANE (1920) from other hosts from the same region. The two species have been shown above to be distinct.

The additional morphological data given here for both species show that several characters used previously to differentiate these species from congeners are invalid. BAYLIS and LANE (1920) did not prepare apical mounts of the head and as a consequence misinterpreted the morphology of the lips. The morphology of the pseudolabia is in fact the same as in other members of the genus, with each of the three lobes bearing two thickenings, generally referred to as "teeth". The teeth of the middle lobe interlock and are prominent in apical view, but were not described in *E. spinosissimus* by BAYLIS and LANE (1920). The teeth of the dorsal and ventral lobes have a similar pair of teeth but these were described by BAYLIS and LANE (1920). DEARDORFF *et al.* (1981) in assessing the genealogical relationships within the genus, used the presence of only four pseudolabial teeth in *E. uncinatus* (= *spinosissimus*) as an apomorphic character separating it from congeners with six teeth. In fact *E. uncinatus* and *E. spinosissimus* both have six teeth on each pseudolabium, exactly equivalent with congeners.

The presence of a gubernaculum was also used by DEARDORFF *et al.* (1981) to separate various species from *E. uncinatus* and *E. spinosissimus* which was considered, from the literature, to lack this structure. In fact a gubernaculum is present in both *E. uncinatus* and *E. spinosissimus*, and does not separate the species from congeners.

The lack of a rugose area on the tail of *E. spinosissimus* compared with the well-developed rugose areas in *E. uncinatus* emphasises the importance of this character in the separation of species. It has been employed previously (DEARDORFF and KO (1983) in the separation of *E. sinensis* Ko, 1975, from *E. overstreeti* Deardorff and Ko, 1983. It is evident that several other species of the genus may need to be re-examined from the point of view of lip morphology, rugose areas and presence of a gubernaculum before a comprehensive assessment of relationships within the genus can be made.

Both *E. uncinatus* and *E. spinosissimus* can be differentiated from *E. multidentatus* Baylis and Lane, 1920, *E. pseudouncinatus* Milleman, 1963, and *E. southwelli* Baylis and Lane, 1920, by the greater number of rows of cephalic spines (greater than 21), and from *E. diazi* Troncy, 1969, *E. daileyi* Deardorff, Brooks and Thorson, 1981, *E. overstreeti* and *E. sinensis* by the arrangement of the caudal papillae in the male, since in none of the latter species are the fourth to sixth pairs arranged in a cluster. *E. mobulae* Kalyankar, 1971, was considered a *species inquirenda* by Ko (1975) and SOOD (1983) and has therefore not been considered here.

No attempt has been made here to give a full synonymy of each species. Not only has there been considerable confusion between adults of the two species in the literature, but

the application by BAYLIS and LANE (1920) of a name to a larval form has resulted in a number of new species being described from larval forms only as well as a variety of larvae from molluscan hosts having been attributed to *E. uncinatus* on extremely meagre evidence. Most of the recent records of *E. uncinatus* and *E. spinosissimus* are from the Indian region and have been summarised by SOOTA (1983). Only the reference of ANYA (1977) has apparently been omitted. ANYA (1977) described a new species, *E. oligocanthus*, but the species is based on larval forms and is considered a *species inquirenda*. *E. mobulae* described from adult nematodes from *Mobula diabolus* (Shaw, 1804) from India was considered indistinguishable from congeners by Ko (1975) and was therefore considered a *species inquirenda*. SOOTA (1954) and SHAFEE and NATARAJAN (1976) have reported *E. spinosissimus*, confirming earlier records, but neither paper provided sufficient morphological evidence to verify the determinations. In addition, SHAFEE and NATARAJAN (1976) described *E. uncinatus* from the same host, *Aetobatus narinari* (Euphrasen, 1790), but again the determinations cannot be verified.

In view of the fact that both species, *E. uncinatus* and *E. spinosissimus*, are here considered valid, additional material from Indian and European hosts will have to be examined critically before the definitive host range and geographic distribution of the two species can be accurately ascertained.

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